

JOURNAL OF
NUCLEAR
SCIENCE, NUCLEAR
ENGINEERING, AND
NUCLEAR TECHNOLOGY



136

NUCLEAR APPLICATIONS & TECHNOLOGY®

A JOURNAL OF THE AMERICAN NUCLEAR SOCIETY

ROY G. POST, *Editor*

VOLUME 9

July 1970 through December 1970

AMERICAN NUCLEAR SOCIETY

244 EAST OGDEN AVENUE
HINSDALE, ILLINOIS 60521 USA

Copyright © 1970, by American Nuclear Society, Inc., Hinsdale, Illinois 60521

CONTENTS OF VOLUME 9

TECHNICAL PAPERS AND NOTES

VOLUME 9, NO. 1 JULY, 1970 / PAGES 1-120

SYMPOSIUM ON THEORETICAL MODELS FOR PREDICTING IN-REACTOR PERFORMANCE OF FUEL AND CLADDING MATERIAL

Preface A. L. Lotts 7

FUELS I - SPECIAL SESSION ON FUEL CLADDING MODELS

Introduction A. L. Lotts 9

The Effects of Fast Flux Irradiation on the Mechanical Properties and Dimensional Stability of Stainless Steel ...
T. T. Claudson, R. W. Barker, and R. L. Fish 10

An Analysis of Fast Neutron Effects on Void Formation and Creep in Metals S. D. Harkness, J. A. Tesk,
and Che-Yu Li 24

New Correlations Involving the Low-Cycle Fatigue and Short-Term Tensile Behavior of Irradiated and Unirradiated 304 and 316 Stainless Steel J. B. Conway,
J. T. Berling, and R. H. Stentz 31

Theoretical Analysis of Cladding Stresses and Strains Produced by Expansion of Cracked Fuel Pellets
J. H. Gittus, D. A. Howl, and H. Hughes 40

Axial Ratchetting of Fuel Under Pressure Cycling Conditions Eliot Duncombe and Ivan Goldberg 47

CRASH—A Computer Program for the Evaluation of the Creep and Plastic Behavior of Fuel-Pin Sheaths
M. Guyette 60

REACTORS

A Three-Dimensional Method for Design Studies of Xenon-Induced Spatial Power Oscillations R. C. Kern,
W. C. Coppersmith, and Z. R. Roszloczy 70

The Nuclear Performance of Fusion Reactor Blankets ...
D. Steiner 83

FUELS

Calculational Models for Fast Reactor Fuel-Cycle Analysis
Thomas J. Hirons and R. Douglas O'Dell 93

INSTRUMENTS

The Effects of Contaminants in Methane as a Proportional Tube Counting Gas. F. E. Armstrong,
W. D. Howell, and D. W. Whitlock 107

Evaluation of CdTe as an Integral Gamma-Ray Counter ...
H. H. Nichols and J. M. Palms 112

VOLUME 9, NO. 2 AUGUST, 1970 / PAGES 121-280

SYMPOSIUM ON THEORETICAL MODELS FOR PREDICTING IN-REACTOR PERFORMANCE OF FUEL AND CLADDING MATERIAL

FUELS II - SPECIAL SESSION ON FUEL PERFORMANCE MODELS

Introduction H. Pearlman 127

Theories of Swelling and Gas Retention in Ceramic Fuels ...
Brian R. T. Frost 128

A Fission Gas Swelling Model Incorporating Re-Solution Effects C. C. Dollins and H. Ocken 141

A Statistical Fuel Swelling and Fission Gas Release Model.
H. R. Warner and F. A. Nichols 148

Interpretations of Fission Gas Behavior in Refractory Fuels R. L. Ritzman, A. J. Markworth, W. Oldfield,
and W. Chubb 167

Some Considerations of the Behavior of Fission Gas Bubbles in Mixed-Oxide Fuels Che-Yu Li,
S. R. Pati, R. B. Poeppel, R. O. Scattergood,
and R. W. Weeks 188

A Computer Program to Predict the Performance of UO₂ Fuel Elements Irradiated at High Power Outputs to a Burn-up of 10 000 MWd/MTU M. J. F. Notley 195

COMETHE II—A Computer Code for Predicting the Mechanical and Thermal Behavior of a Fuel Pin
R. Godesar, M. Guyette, and N. Hoppe 205

REACTOR SITING

The Nuclear Criticality Safety Aspects of Plutonium-238 ..
Richard A. Wolfe 218

FUELS

Accurate Absolute Determination of Fission Densities in Fuel Rods by Means of Solid-State Track Detectors
M. De Coster and D. Langela 229

Internal Gas Pressure Behavior in Mixed-Oxide Fuel Rods During Irradiation T. B. Burley and M. D. Freshley 233

ECONOMICS

Utility Incentives for Implementing Crossed-Progeny Fueling L. W. Lang 242

MATERIALS

Thermal Convection Loop Tests of Nb-1% Zr Alloy in Lithium at 1200 and 1300°C C. E. Sessions
and J. H. DeVan 250

Environmentally Aggravated Fatigue Cracking of Zircaloy-2 Lee A. James 260

TECHNIQUES

Measurement of Low Levels of Iodine-131 in Reactor Atmospheres ... V. C. Furtado, T. J. Kneip, and M. Eisenbud 268

EDUCATION

Nuclear Engineering Internships Robert L. Carter 274

VOLUME 9, NO. 3 SEPTEMBER, 1970 / PAGES 281-444

SYMPOSIUM ON THEORETICAL MODELS FOR PREDICTING IN-REACTOR PERFORMANCE OF FUEL AND CLADDING MATERIAL

FUELS III - SPECIAL SESSION ON INTEGRAL FUEL ELEMENT PERFORMANCE MODELS

Introduction C. E. Weber 287

Effects of Different Types of Void Volumes on the Radial Temperature Distribution of Fuel Pins H. Kämpf
and G. Karsten 288

CONTENTS OF VOLUME 9

TECHNICAL PAPERS AND NOTES

Mechanical and Thermal Analysis of Cylindrical Fuel Elements During Off-Normal Conditions After Extended Burn-up.	T. R. Bump	301
Evaluation of a Model for Predicting Fast-Reactor Fuel-Pin Deformations	K. R. Merckx	309
Performance Analysis of a Mixed-Oxide LMFBF Fuel Pin	C. M. Cox and F. J. Homan	317
Fast Reactor Fuel Performance Model Development	A. Boltax, P. Murray, and A. Bianchiera	326
Non-Steady-State Factors in Models for Swelling of Oxide Fuels	D. P. Hines, S. Oldberg, and E. L. Zebroski	338
The Growth and Stability of Voids in Irradiated Metals	R. Bullough, B. L. Eyre, and R. C. Perrin	346

FUEL CYCLES

Optimization of Fuel Loadings for High Power Test Reactors	H. J. Reilly and L. E. Peters, Jr.	356
--	------------------------------------	-----

FUELS

An Estimate of the Enhancement of Fission Product Release from Molten Fuel by Thermally Induced Internal Circulation.	M. H. Fontana	364
---	---------------	-----

ECONOMICS

A Long Range Planning Model of the USAEC Gaseous Diffusion Plant	Henry Stone, A. de la Garza, and R. L. Hoglund	376
--	--	-----

MATERIALS

Cryogenic Tensile Properties of Irradiated Beryllium, Titanium, and Aluminum Alloys	J. R. Coombe and R. P. Shogan	396
---	-------------------------------	-----

INSTRUMENTS

Testing for Incipient Failure of Relays in Reactor Circuits.	John Perreault and Lawrence Ruby	402
--	----------------------------------	-----

ANALYSIS

A New Boron Analysis Method	J. Weitman, N. Däverhög, and S. Farvolden	408
---------------------------------------	---	-----

TECHNIQUES

Remote Analyses by Atomic Absorption Spectrophotometry.	W. R. Sovereign, E. R. Ebersole, R. Villareal, and W. A. Hareland	416
---	---	-----

Hydraulic Impedance: A Tool for Predicting Boiling Loop Stability.	T. T. Anderson	422
--	----------------	-----

RADIOISOTOPES

Effective Alpha Activity and Self-Absorption Alpha Range in ²³⁸ PuO ₂ Microspheres	Gary N. Huffman and Carl J. Kershner	434
--	--------------------------------------	-----

SHIELDING

Gamma-Ray Buildup Factor Coefficients for Concrete and Other Materials	D. K. Trubey	439
--	--------------	-----

VOLUME 9, NO. 4 OCTOBER, 1970 / PAGES 445-614

REACTORS

Neutron-Energy Spectra for Fast Reactor Irradiation Effects	D. Okrent, W. B. Loewenstein, A. D. Rossin, A. B. Smith, B. A. Zolotar, and J. M. Kalfelz	45
In-Place Testing of the Hanford Reactor Charcoal Confinement Filter Systems Using Iodine Tagged with Iodine-131	J. E. Mecca and J. D. Ludwick	51

FUEL CYCLES

Plutonium Recycle Studies for the SENA PWR Reactor	J. Debrue, P. Deramaix, and F. de Waegh	51
--	---	----

FUELS

Burst Strength of EBR-II Irradiated Fuel Pin Sections	R. L. Fish, J. J. Holmes, and R. D. Leggett	52
Uranium-Plutonium Mixed Oxide Sol-Gel Irradiation Experiments	C. Lepsky, P. L. Rotoloni, G. Testa, and G. Trezza	53

MATERIALS

Effect of Irradiation on the Elevated Temperature Fracture of Selected Face-Centered Cubic Alloys.	M. Kangilaski, S. L. Peterson, J. S. Perrin, and R. A. Wullaert	55
Incoloy 800: Enhanced Resistance to Radiation Damage	D. G. Harman	56

RADIOISOTOPES

Reentry Protection for Radioisotope Heat Sources	Thomas S. Bustard, Frank T. Princiotta, and Harold N. Barr	57
--	--	----

ANALYSIS

An Analog Computer Controlled Gamma-Ray Spectrometer for Comparative Activation Analysis.	P. C. Jurs and T. L. Isenhour	58
Analysis of Gamma-Ray Spectroscopy Data	J. A. Baran, R. S. Reynolds, R. E. Faw, and W. R. Kimel	59
Calculation of the Long-Lived Induced Activity in Soil Produced by 200-MeV Protons	T. A. Gabriel	60

VOLUME 9, NO. 5 NOVEMBER, 1970 / PAGES 615-774

REACTORS

Physics of Operating Boiling Water Reactors	E. D. Fuller	62
Physics of Operating Pressurized Water Reactors	A. F. McFarlane	63
Physics Performance of Shippingport	C. A. Flanagan	64
Experience with Xenon Oscillations	W. E. Graves	65
Average Thermal Neutron Capture Cross Sections of ¹⁹⁸ Au, ⁶⁵ Ni, and ⁶⁶ Cu	V. Serment, A. Abu-Samra, and A. H. Emmons	66

CHEMICAL PROCESSING

Spontaneous Deposition of Polonium-210 from Chloride Solution	C. H. H. Chong and M. D. Prisc	66
---	--------------------------------	----

CONTENTS OF VOLUME 9

TECHNICAL PAPERS AND NOTES

FUELS

Achieving High Exposure in Metallic Uranium Fuel Elements *R. D. Leggett, R. K. Marshall, C. R. Hann, and C. H. McGilton* 673

Single- and Two-Phase Pressure Drops on a 16-Rod Bundle *P. Grillo and V. Marinelli* 682

The Application of Reliability Margin Analysis to Fuel Element Performance *C. W. Sayles* 694

Helium Production in EBR-II Irradiated Stainless Steel *N. D. Dudey, S. D. Harkness and H. Farrar, IV* 700

Rate Controlling Factors in the Carbothermic Synthesis of Advanced Fuels *T. B. Lindemer* 711

MATERIALS

Flowing Sodium Capsules in the GETR *D. L. Brown and G. W. Tumell* 716

AEROSPACE

Interactions Between Radiation Fields from Radioisotope Thermoelectric Generators and Scientific Experiments on Spacecraft *C. G. Miller and V. C. Truscello* 722

INSTRUMENTS

A Neutron Detection System for Operation in Very High Gamma Fields *D. P. Roux, J. T. De Lorenzo, and C. W. Ricker* 736

Evaluation of a Neutron Detection System in a Cobalt-60 Field of 10^7 R/h *A. R. Buhl, N. J. Ackermann, Jr., and J. T. De Lorenzo* 744

TECHNIQUES

Techniques for Two-Dimensional Gamma-Ray Scanning of Reactor Fuel Element Sections *B. K. Barnes, D. M. Holm, W. M. Sanders, D. D. Clinton, and J. E. Swansen* 746

Burnup Determination of Nuclear Fuels by High Resolution Gamma Spectrometry, Track Formation in Solid-State Detectors, and Neutron Dose Measurements *P. Popa, M. De Coster, and D. Langella* 755

Estimation Techniques for Far-Field Exposure Contributions *R. S. Reynolds and N. D. Eckhoff* 762

REACTOR SITING

Prediction of the Incipient Boiling Conditions Following a Blocked LMFBR Subassembly Accident *Ralph M. Singer and Robert E. Holtz* 767

MATERIALS

Ductility Loss in Fast Reactor Irradiated Stainless Steel *A. L. Ward and J. J. Holmes* 771

VOLUME 9, NO. 6 DECEMBER, 1970 / PAGES 775-888

REACTOR SITING

A Bootstrap Concept of a Safety Test Facility *Charles N. Kelber* 780

REACTORS

Civil Defense Implications of a Pressurized Water Reactor in a Thermonuclear Target Area *C. V. Chester and R. O. Chester* 786

FUEL CYCLES

Evaluation of ISOCHek and INVENT Fuel Inventory Calculational Models *R. C. Kern and M. V. Bonaca* 796

CHEMICAL PROCESSING

Uranium-233-Bearing Salt Preparation for the Molten Salt Reactor Experiment *J. M. Chandler and S. E. Bolt* 807

An Empirical Formula Which Predicts the Critical Parameters of a Planar Array of Uranium-Solution-Filled Cylinders *Harold E. Clark and Grover Tuck* 814

RADIOACTIVE WASTE

The Feasibility of Incorporating Radioactive Wastes in Asphalt or Polyethylene *C. L. Fitzgerald, H. W. Godbee, R. E. Bianco, and W. Davis, Jr.* 821

RADIOISOTOPES

The Synthetic Actinides—From Discovery to Manufacture *Glenn T. Seaborg* 830

ANALYSIS

Pulsed-Neutron Activation Analysis System for Short-Lived Radioisotopes *William F. Naughton and William A. Jester* 851

Proton Microprobe Analysis of the Surface of Stranded Wire in the Lunar Module *Gerald M. Padawer* 856

Laboratory and Environmental Mineral Analysis Using a Californium-252 Neutron Source *R. W. Perkins, L. A. Rancitelli, J. A. Cooper, and R. E. Brown* 861

TECHNIQUES

A ^{244}Cm -Be Isotopic Neutron Source *D. C. Stewart, E. P. Horwitz, C. H. Youngquist, and M. A. Wahlgren* 875

DEPARTMENTS

CONTENTS - - - - - 3, 122, 282, 446, 616, 776

CORRIGENDA - - - - - 621, 779

LETTERS TO EDITOR - - - - - 450

BOOK REVIEWS - - - - - 442, 773

VOLUME 9 INDEXES - - - - - 780

VOLUME 9 CONTENTS - - - - - iii



ANS ORGANIZATION

OFFICERS, BOARD OF DIRECTORS, AND COMMITTEES

OFFICERS

N. Joseph Palladino
President

John W. Landis
Vice Pres./Pres. Elect.

James R. Lilienthal
Treasurer

Octave J. Du Temple
Executive Secretary

Raymond D. Maxson
Assistant Treasurer

EXECUTIVE COMMITTEE

N. Joseph Palladino, *Chairman*
William A. Chittenden
Gerhard Dessauer

John W. Landis
James R. Lilienthal
Louis H. Roddis, Jr.

Frank Schroeder, Jr.
John J. Taylor
J. Ernest Wilkins, Jr.

BOARD OF DIRECTORS

W. Howard Arnold, Jr.
Vincent S. Boyer
E. Alfred Burrill
Bengt G. Carlson
Jack Chernick
Arthur B. Chilton

William A. Chittenden
Eric T. Clarke
Karl P. Cohen
Gerhard Dessauer
Richard Ehrlich
Don E. Ferguson

Henry J. Gomborg
Paul Greebler
Vincent P. Guinn
John W. Landis
Harry Lawroski
James R. Lilienthal

Walter J. McCarthy, Jr.
John W. Morfitt
Raymond L. Murray
N. Joseph Palladino
Harry Pearlman
Louis H. Roddis, Jr.

Murray W. Rosenthal
Frank Schroeder, Jr.
John J. Taylor
J. Ernest Wilkins, Jr.
Karl E. J. Wirtz
Clifford B. Zitek

COMMITTEES

ADMISSIONS

Eric T. Clarke, *Chairman*
Donald H. Ahmann
W. O. Harms
J. Lawrence Meem, Jr.
Marlin E. Remley

BYLAWS AND RULES

John C. Liwosz, *Chairman*
Charles D. Harrington
Donald R. Harris, Jr.
Frederick S. Kirn
Willard H. Nutting

CRITICAL REVIEWS

Sidney Siegel, *Chairman*
Jack Chernick
William Chittenden
Paul Lottes
Peter Murray
David Okrent
Herbert Parker
Joseph Prestele
W. C. Redman
Charles Stevenson
Bertram Wolfe
Don E. Ferguson

FINANCE

J. Ernest Wilkins, Jr., *Chairman*
Eric T. Clarke
Walter J. McCarthy, Jr.
Harry Lawroski
Ex Officio
N. Joseph Palladino
James R. Lilienthal
Raymond D. Maxson

HONORS AND AWARDS

Allan F. Henry, *Chairman*
Manson Benedict
Vincent S. Boyer
Jack Chernick
D. G. Hurst

HONORS AND AWARDS (Cont'd.)

J. A. Lane
Thoma M. Snyder
Hugh S. Stewart
Fred W. Thalgot

LOCAL SECTIONS

W. Herbert Pennington, *Chairman*
William R. Kanne
Joel V. Levy
John C. Liwosz
Donald R. MacFarlane
W. S. Minkler
Paul D. O'Brien
Paul L. Roggenkamp
Patrick J. Selak
Robert J. Tallman

MEMBERSHIP

Sumner W. Kitchen, *Chairman*
Sidney A. Bernsen
Albert Carnesale
Walter H. Esselman
Wayne H. Jens
R. J. LaBaue
Charles P. Ross
Albert F. McGirt
Karl Wirtz
Edward R. Wiot

NOMINATING

Louis H. Roddis, *Chairman*
Robert W. Deutsch
Charles D. Harrington
John P. Howe
Harry Lawroski
Kenneth E. Roach
Clifford B. Zitek

PLANNING

N. Peter Morris, *Chairman*
O. J. Du Temple
William R. Kimel

PLANNING (Cont'd.)

Saul Levine
Lawrence E. Minnick
Warren E. Nyer
Sidney Siegel
John J. Taylor
Robert F. Trapp
Robert E. Uhrig
E. L. Zebroski

PROFESSIONAL DIVISIONS

Alfred Amorosi, *Chairman*
James F. Black
Vincent P. Guinn
Lester Kornblith, Jr.
Wallace R. Simmons
Wilson K. Talley
Paul F. Zweifel

PROGRAM

Melvin J. Feldman, *Chairman*
Felix T. Adler
Eric S. Beckjord
Sidney A. Bernsen
Melvin L. Bleiberg
Thomas S. Bustard
K. Bingham Cady
Ersel A. Evans
Kermit L. Garlid
Ely M. Gelbard
Russell L. Heath
Edwin M. Kinderman
Harry Lawroski
Edward A. Mason
Gilbert B. Melese d'Hospital
W. C. Redman
Robert F. Redmond
Mortimer A. Schultz
Paul G. Shewmon
Louis M. Shotkin
Joseph Silverman
A. Einar Swanson
Robert E. Uhrig
Walter H. Wolf
John B. Yasinsky

PROGRAM (Cont'd.)

Ex Officio
Robert W. Dickinson
Octave J. Du Temple

PUBLIC INFORMATION

Daniel K. Park, *Chairman*
Gene A. Blanc
Pietro Bullio
Francis P. Cotter, Jr.
Theodore W. Edwards
Joseph Finke
Jerry Halvorsen
Demetrius G. Jelatis
William Kerr
C. G. M. (Mike) McCormack
Ashton J. O'Donnell
Theodore J. Slosek
Theos J. Thompson

PUBLICATIONS

Robert W. Dickinson, *Chairman*
Lamar P. Bupp
E. Alfred Burrill
Margaret K. Butler
James D. Cape
Paul Cohen
Michael D. D'Agostino
Gerhard Dessauer
James J. Dutton
Robert M. Jefferson
Joseph B. Knox
Ara J. Mooradian
Ex Officio
Dixon Callihan
Roy G. Post
Norman Jacobson

STANDARDS

Ralph G. Chalker, *Chairman*
Walter J. McCarthy, Jr.,
Vice Chairman
A. W. Savolainen, *Secretary*
Dixon Callihan
William A. Chittenden
James E. McLaughlin, Jr.
James S. Moore



ANS ORGANIZATION

DIVISIONS AND GROUPS

AEROSPACE DIVISION

Willard E. Matheson, *Chairman*
Ronald E. Anderson
Robert D. Brooks
Robert L. Detterman
Joseph G. Gallagher
William E. Gernert
L. D. Percival King
Milton Lewis
George McLafferty
John Orndoff
Harold P. Smith, Jr.
Ex Officio
Elias P. Gyftopoulos
Alfred Amorosi

EDUCATION DIVISION

Pietro F. Pasqua, *Chairman*
Albert Carnesale
Kermit L. Garlid
W. Reed Johnson
William R. Kimel
Robert L. Long
Hans Mark
George H. Miley
Robert F. Redmond
Andrew Robeson
Warren F. Witzig
James H. Wright
Max L. Yeater
Ex Officio
Alfred Amorosi
William Kerr

ISOTOPES AND RADIATION DIVISION

Richard E. Wainerdi, *Chairman*
Oscar M. Bizzell
Thomas S. Bustard
Richard L. Caldwell
Farno L. Green
George W. Leddicotte
Willard F. Libby
Herbert R. Lukens, Jr.
Bernard Manowitz
Mary Jane Oestmann
Enzo Ricci
James J. Smith
Gene L. Woodruff
Ex Officio
Alfred Amorosi
Gordon L. Brownell

MATERIALS SCIENCE AND TECHNOLOGY DIVISION

Jack G. Conner, *Chairman*
Melvin L. Bleiberg
Warren P. Chernock
Socrates Christopher
John E. Cunningham
Harry M. Ferrari
Donald L. Keller
J. Howard Kittel
Peter Murray
Lawrence A. Neimark
Harry Pearlman
Albert J. Rothman
Richard E. Skavdahl

MATERIALS SCIENCE AND TECHNOLOGY DIVISION (Cont'd.)

Ex Officio
Alfred Amorosi
Don R. de Halas

MATHEMATICS AND COMPUTATION DIVISION

Kaye D. Lathrop, *Chairman*
Robert J. Breen
Russell L. Crowther
Robert A. Dannels
Reimar Froehlich
William L. Hendry
Paul Michael
Donald H. Roy
Fred C. Shure
Weston M. Stacey, Jr.
John E. Suich
G. Elliott Whitesides
Ex Officio
Alfred Amorosi
Eugene L. Wachspress

NUCLEAR CRITICALITY SAFETY DIVISION

Hugh K. Clark, *Chairman*
C. Leslie Brown
D. Frank Cronin, Jr.
David M. Dawson
David L. Hetrick
William R. Housholder
Wade C. McCluggage
Jack D. McLendon
William A. Pryor
Stanton L. Reese
David R. Smith
B. J. Youngblood
Ex Officio
Alfred Amorosi
E. Duane Clayton

POWER DIVISION

Louis J. Weidner, Jr., *Chairman*
John B. Anderson
Samuel E. Beall, Jr.
Roger S. Boyd
William J. Cahill, Jr.
William A. Chittenden
Robert J. Creagan
Thomas R. Cuerou
Fred A. Hollenbach
Orville E. Homeister
Roland J. Jensen
John H. MacMillan
Eugene W. O'Rourke
Eugene C. Starr
A. Einar Swanson
William N. Thomas
Ex Officio
Alfred Amorosi
Robert J. Creagan

REACTOR OPERATIONS DIVISION

J. Lawrence Meem, Jr., *Chairman*
Harold T. Babb
Vincent S. Boyer
Charles E. Branyan
Frank L. Kelly
Gerald C. Kinne
John D. Randall
Marlin E. Remley
Earl O. Smith
Eugene H. Smith
Ronald C. Stinson, Jr.
Dudley Thompson
Marvin E. Wyman
Ex Officio
Alfred M. Amorosi
Sal Sandhaus

REACTOR PHYSICS DIVISION

Frank Feiner, *Chairman*
Harry Alter
Martin Becker
Frank G. Dawson
Theodore C. Engelder
Paul Greebler
Henry C. Honeck
Charles N. Kelber
John S. King
Jay F. Kunze
Charles A. Preskitt, Jr.
Sidney Visner
Paul F. Zweifel
Ex Officio
Alfred M. Amorosi
Theos J. Thompson

REMOTE SYSTEMS TECHNOLOGY DIVISION

Julius B. Godel, *Chairman*
J. Paul Bacca
Robert E. Brooksbank
William D. Burch
Frederick D. Carpenter
Melvin S. Coops
John E. Gates
Norman C. Howard
Robert M. Jefferson
Demetrius G. Jelatis
Calvin E. Lamb
Donald P. Mingesz
Ex Officio
Alfred M. Amorosi
Harry Lawroski

SHIELDING AND DOSIMETRY DIVISION

H. E. Hungerford, Jr., *Chairman*
Rufard G. Alsmiller, Jr.
J. R. Beyster
Charles E. Clifford
Donald R. F. Cochran
Donald J. Dudziak
Charles M. Huddleston
Martin Leimdorfer
Philip S. Mittelman
Keran O'Brien

SHIELDING AND DOSIMETRY DIVISION (Cont'd.)

A. Edward Profio
Wade E. Selph
David K. Trubey
Ex Officio
Alfred M. Amorosi
Anthony H. Foderaro

TECHNICAL GROUP FOR NUCLEAR EXPLOSION ENGINEERING

Joseph B. Knox, *Chairman*
R. Lee Aamodt
Charles R. Boardman
Frank Chilton
Henry F. Coffey
Russell E. Duff
Henry J. Gomborg
Paul Kruger
Milo D. Nordyke
John F. Philip
Philip L. Randolph
Frank W. Stead
Luke J. Vortman
Ex Officio
Alfred M. Amorosi
Wilson K. Talley

TECHNICAL GROUP FOR NUCLEAR FUEL CYCLES

Robert B. Richards, *Chairman*
John O. Blomeke
Leslie Burris, Jr.
Delmar L. Crowson
George R. Fanjoy
Rafford L. Faulkner
Leonard Geller
Allison M. Platt
Wesley Lewis
Edward A. Mason
Rueben L. Peterson
William F. Roche
Walton A. Rodger
Yves J. Sousselier
A. F. Veras
Donald S. Webster
George Weller
Ex Officio
Alfred M. Amorosi

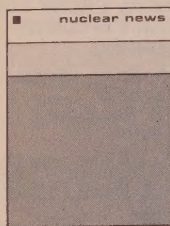
TECHNICAL GROUP FOR ENVIRONMENTAL SCIENCES

Leonard E. Link, *Chairman*
Dean E. Abrahamson
Robert E. Bailey
Ronald D. Doctor
Robert G. Gardner
Stephen Hastings
William J. Mecham
Mary J. Oestmann
John J. Roberts
J. Jay Sabo
M. F. Sankovich
John W. Winchester
James Wright

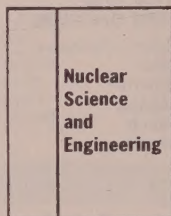
ANS PERIODICALS



The following periodicals are published by the American Nuclear Society. Prices shown are for nonmembers. Membership information with membership subscription rates is available on request. Some back issues are still available at special prices.



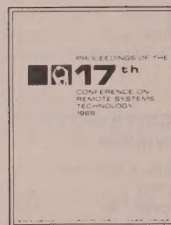
NUCLEAR NEWS presents a monthly review of current news in the nuclear field with emphasis on the latest general developments. Articles of special interest and technical meeting reports are featured each month. It also carries up-to-date information on the activities of the American Nuclear Society. Subscriptions: \$18./year U.S.A.; \$20./year Foreign.



NUCLEAR SCIENCE & ENGINEERING is a technical journal that publishes reviewed articles concerned with *research and development* in the areas of nuclear science, engineering and related technologies. Four volumes of three issues each are published annually. Subscriptions: \$110/year U.S.A.; \$115/year Foreign.



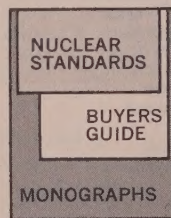
NUCLEAR APPLICATIONS AND TECHNOLOGY publishes reviewed technical articles related to the *applications* of nuclear science and engineering and related technology. Two volumes of six issues each are published annually. Subscriptions: \$55/a year volume U.S.A.; \$58/a year Foreign.



PROCEEDINGS OF THE CONFERENCE ON REMOTE SYSTEMS TECHNOLOGY contains the complete papers presented at an annual conference which is sponsored by the Remote Systems Technology Division of the American Nuclear Society. It is indexed by subject, author, and keyword. One volume of one issue is published annually. Subscription: \$11/volume U.S.A.; \$12/volume Foreign.



TRANSACTIONS of the American Nuclear Society contains 400-600 word summaries of papers presented at the Annual and Winter Meetings of the Society. The summaries are reviewed and published within a 90-day period. **TRANSACTIONS** is indexed by subject and author. It also carries a schedule of meeting sessions and other functions. Subscriptions: one volume of two issues, \$28/U.S.A.; \$29.50/year Foreign.



OTHER PUBLICATION ACTIVITIES
In addition to its regular periodical program, the ANS publishes *monographs*, a book series developed in conjunction with the AEC, *special proceedings* of important conferences such as the International Conference on the Constructive Uses of Atomic Energy, *nuclear standards*, and the *nuclear news buyers guide*, issued in February of each year.

SAMPLE COPIES AVAILABLE BY LETTERHEAD REQUEST

Write Today

**AMERICAN NUCLEAR SOCIETY
244 East Ogden Avenue
Hinsdale, Illinois 60521**

The American Nuclear Society, founded in 1954, is an international society of nuclear scientists, engineers, students, and related personnel. It is a professional, nonprofit organization that is privately financed and dedicated to the peaceful application and advancement of nuclear energy.